Did you know? Nitrogen Deposition from the Atmosphere: the Lesser Known Source

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Did you know that nitrogen deposited from the atmosphere is actually one of the larger sources of nutrient pollution to the Chesapeake Bay? Atmospheric deposition is a process that has always occurred, and is basically when anything falls to the earth's surface from the atmosphere (precipitation, aerosols, gases etc.). However, in more recent years deposition has become newsworthy because of acidic rain and particles having negative effects on freshwater ecosystems, and in this area, excessive nitrogen entering the Chesapeake Bay watershed. This nitrogen is sent into the atmosphere primarily from burning fossil fuels (power plants, cars, factories, etc.), but also originates as ammonia gas when fertilizer or manure is applied to fields. Nitrogen deposition is a large component of the nitrogen cycle in the Chesapeake Bay region, and is therefore contributing to the pollution and eutrophication occurring in The Bay. Over a 20 year period between 1985 and 2005, an EPA study concluded that atmospheric deposition was the largest nitrogen input into the Bay. Yet by 2005, fertilizer runoff from the land had passed atmospheric deposition on the list (Figure L-1), the study can be found here.

Atmospheric Deposition Nitrogen Inputs Compared to Other Nitrogen Sources

Atmospheric deposition of nitrogen is the highest nitrogen input load in the Chesapeake watershed (Figure L-1). Other nutrient input loads are fertilizer, manures, point sources, and septic systems. Over the 1985 to 2005 Chesapeake Bay model simulation period, the Chesapeake watershed average atmospheric deposition loads of nitrogen have been declining, particularly those of oxidized nitrogen.

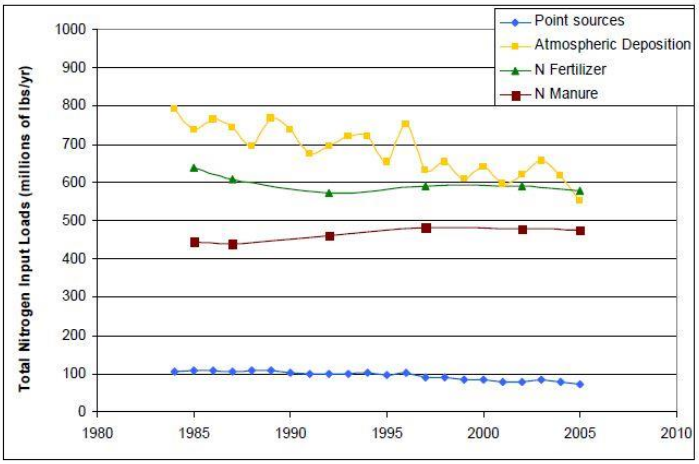

Figure L-1. 20-year (1985–2005) time series of atmospheric, fertilizer, manure, and wastewater treatment plant nitrogen input loads to the Chesapeake Bay Water Quality and Sediment Transport Model.

Throughout the Chesapeake Watershed, between approximately 8 – 26 lbs/acre of Nitrogen were deposited during that time period, depending on which part of the watershed (Figure L-8). As a whole, nitrogen deposition is going down, in part as people become more energy conscious and attempt to use more fuel efficient vehicles and save energy at home. Reduction in nitrogen deposition is also highly attributed to regulations that reduce the amount of nitrogen oxides coming from electric generating power plants. However, energy from fossil fuels will continue to be an important component of the American economy, so atmospheric deposition of nitrogen will continue to be a factor of any regional-scale nutrient management plan in the Chesapeake Bay area.

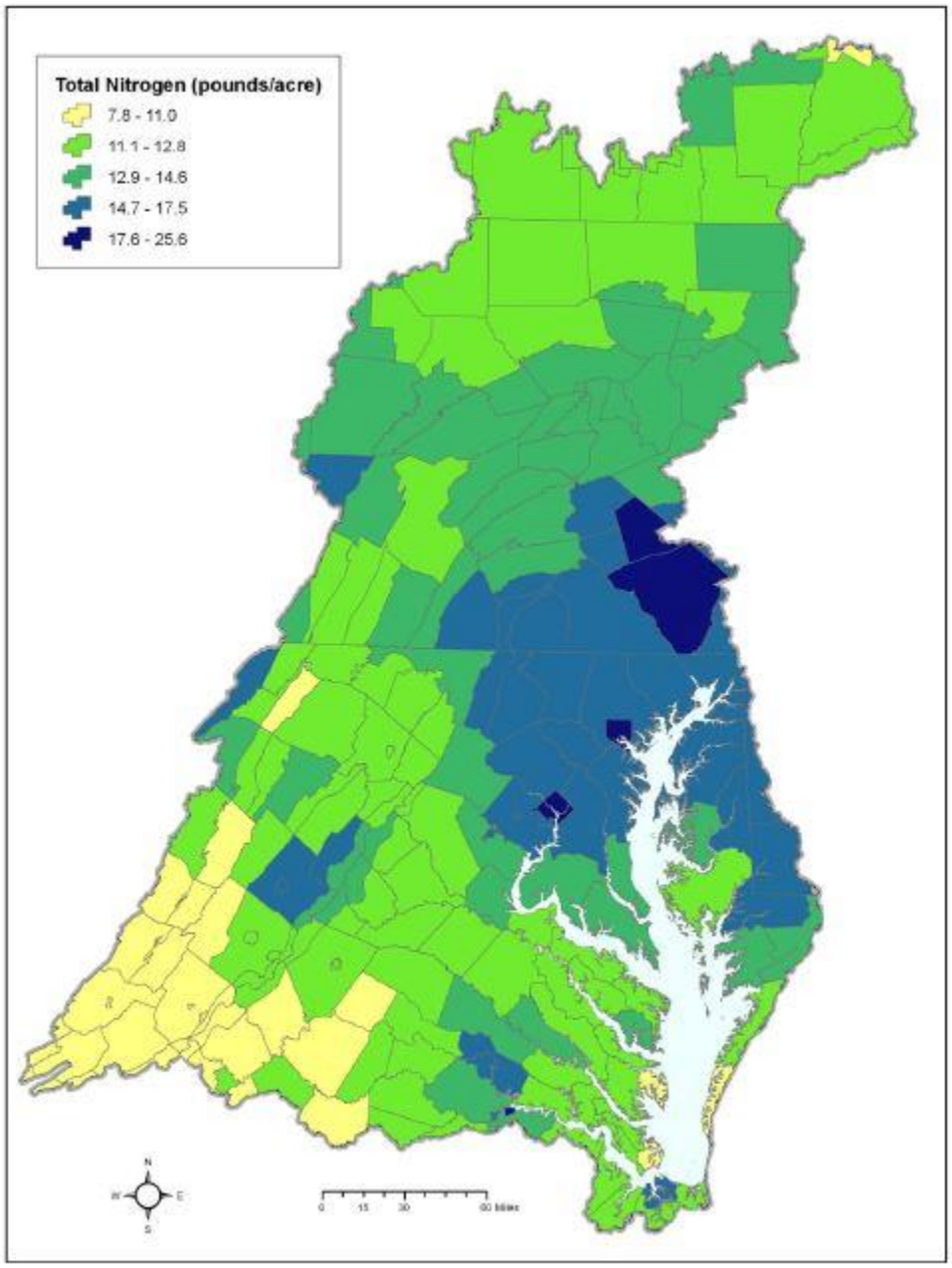

Figure L-8. Annual average DIN atmospheric deposition on land segments in the entire Phase 5.3 Chesapeake Bay Watershed Model domain.

Figure L-8. Nitorgen deposition by county in the Chesapeake Bay Watershed. Origingal report available here.

There are actions that farmers in particular can take to at least locally reduce nitrogen pollution by deposition, without being an economic burden to their business. A recent article from National Public Radio titled, It's Raining Nitrogen In A Colorado Park. Farmers Can Help Make It Stopillustrates farm management practices that biologists have found to be helpful for protecting alpine ecosystems. Ammonia, containing nitrogen in the gaseous form, can come from manure and compost that reacts with the air and soil. Once airborne, ammonia moves with the wind, which in the Front Range area of the Colorado Rockies (Denver Area) is usually from west to east. However, on rare events when wind directions change from east to west, ammonia and nitrogen is whisked straight to the fragile and naturally nutrient-poor alpine systems of Rocky Mountain National Park. As discussed in the article, Jon Slutsky and about 50 other dairy farmers signed up for an optional program to get an alert on their cell phones when wind directions are expected to come from the east. Farmers then could voluntarily choose to move manure on a different day or postpone a fertilizer application. Most of the farmers are willing to change practices, particularly because the wind changes are infrequent and do not create an overwhelming inconvenience.